Microsoft

Explore fundamentals of data

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Agenda

- Core data concepts
- Data roles and services

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Learning objectives

After completing this module, you will be able to:

1. Identify common data formats.
2. Describe options for storing data in files and databases.
3. Describe characteristics of transactional and analytical data processing solutions.
4. Identify common data professional roles.
5. Identify common cloud services used by data professionals.

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1: Core data concepts

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What is data?

Values used to record information – Often representing *entities* that have one or more *attributes*

Structured

Customer				
ID	**FirstName**	**LastName**	**Email**	**Address**
1	Joe	Jones	joe@litware.com	1 Main St.
2	Samir	Nadoy	samir@northwind.com	123 Elm Pl.

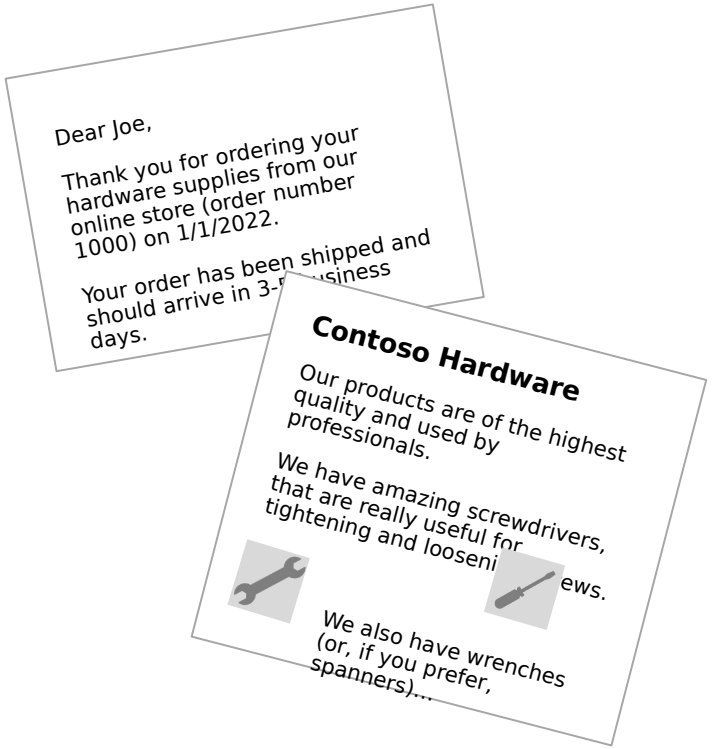
Product		
ID	**Name**	**Price**
123	Hammer	2.99
162	Screwdriver	3.49
201	Wrench	4.25

Semi-structured

```
{
    "firstName": "Joe",
    "lastName": "Jones",
    "address":
    {
        "streetAddress": "1 Main
St.",
        "city": "New York",
        "state": "NY",
        "postalCode": "10099"
    },
    "contact":
    [
        {
          "type": "home",
          "number": "555 12
1234"
        },
        {
          "type": "email",
          "address":
"joe@litware.com"
        }
    ]
}
```

```
{
    "firstName": "Samir",
    "lastName": "Nadoy",
    "address":
    {
        "streetAddress": "123
Elm Pl.",
        "unit": "500",
        "city": "Seattle",
        "state": "WA",
        "postalCode": "98999"
    },
    "contact":
    [
        {
          "type": "email",
          "address":
"samir@northwind.com"
        }
    ]
}
```

Unstructured


Dear Joe,
Thank you for ordering your hardware supplies from our online store (order number 1000) on 1/1/2022.
Your order has been shipped and should arrive in 3-
days.
Contoso Hardware
Our products are of the highest quality and used by professionals.
We have amazing screwdrivers, that are really useful for
tightening and looseni
ews.
We also have wrenches (or, if you prefer, spanners)...

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How is data stored?

Files

Delimited Text

```
FirstName,LastName,Email
Joe,Jones,joe@litware.com
Samir,Nadoy,samir@northwind.com
```

JavaScript Object Notation (JSON)

```
{
  "customers":
  [
    { "firstName": "Joe", "lastName": "Jones"},
    { "firstName": "Samir", "lastName": "Nadoy"}
  ]
}
```

Extensible Markup Language (XML)

```
<Customer firstName="Joe" lastName="Jones"/>
```

Binary Large Object (BLOB)

```
101101011010101100 10...
```

Optimized formats:

- Avro, ORC, Parquet

Databases

Relational

Customer

ID	Email	Address
1	joe@litware.com	1 Main St.
2	samir@northwind.com	123 Elm Pl.

Product

ID	Name	Price
123	Hammer	2.99
162	Screwdriver	3.49
201	Wrench	4.25

Order

OrderNo	OrderDate	Customer
1000	1/1/2022	1
1001	1/1/2022	2

LineItem

OrderNo	ItemNo	ProductID	Quantity
1000	1	123	1
1000	2	201	2
1001	1	123	2

Non-Relational

Products

Key	Value
123	"Hammer ($2.99)"
162	"Screwdriver ($3.49)"
201	"Wrench ($4.25)"

Key-Value

Customers

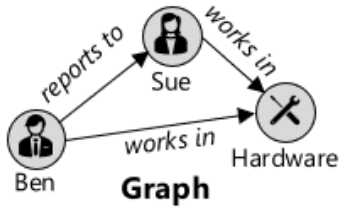
Key	Document
1	{ "name": "Joe Jones" }
2	{ "name": "Samir Nadoy" }

Document

Orders

Key	Customer		Product	
	Name	Address	Name	Price
1000	Joe Jones	1 Main St.	Hammer	2.99
1001	Samir Nadoy	123 Elm Pl.	Wrench	4.25

Column Family



Graph

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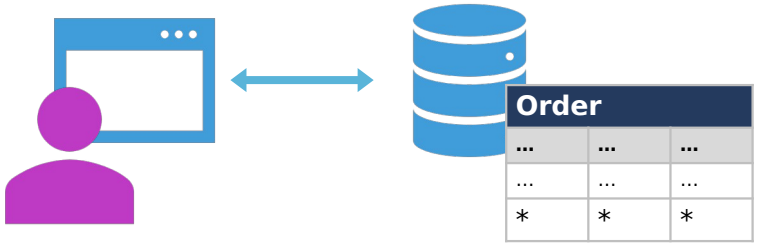
Operational data workloads



Data is stored in a database that is optimized for *online transactional processing* (OLTP) operations that support applications

A mix of *read* and *write* activity

For example:

- Read the *Product* table to display a catalog
- Write to the *Order* table to record a purchase

Data is stored using *transactions*

Transactions are "ACID" based:

- **Atomicity** – Each transaction is treated as a single unit of work, which succeeds completely or fails completely
- **Consistency** – Transactions can only take the data in the database from one valid state to another
- **Isolation** – Concurrent transactions cannot interfere with one another
- **Durability** – When a transaction has succeeded, the data changes are persisted in the database

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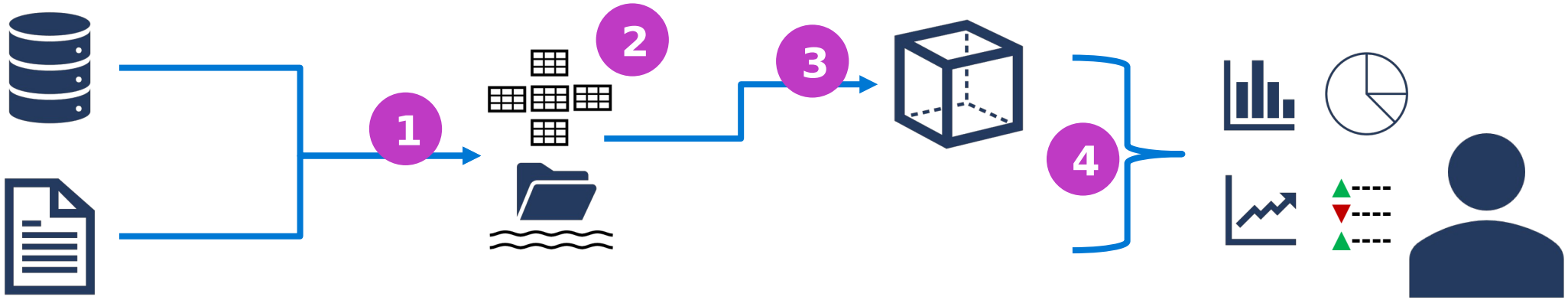
Analytical data workloads



1. Operational data is extracted, transformed, and loaded (ETL) into a *data lake* for analysis
2. Data is loaded into a schema of tables - typically in a Spark-based *data lakehouse* with tabular abstractions over files in the data lake, or a data warehouse with a fully relational SQL engine
3. Data in tables may be aggregated and loaded into an online analytical processing (OLAP) model, or cube
4. The files in the data lake, relational tables, and analytical model can be queried to produce *reports* and *dashboards*

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1: Knowledge check

1 How is data in a relational table organized?

- ◌ Rows and Columns
- ◌ Header and Footer
- ◌ Pages and Paragraphs

2 Which of the following is an example of unstructured data?

- ◌ A comma-delimited text file with *EmployeeID*, *EmployeeName*, and *EmployeeDesignation* fields
- ◌ Audio and Video files
- ◌ A table within relational database

3 What is a data warehouse?

- ◌ A non-relational database optimized for read and write operations
- ◌ A relational database optimized for read operations
- ◌ A storage location for unstructured data files

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2: Data roles and services

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Data professional roles

Database Administrator

- Database provisioning, configuration and management
- Database security and user access
- Database backups and resiliency
- Database performance monitoring and optimization

Data Engineer

- Data integration pipelines and ETL processes
- Data cleansing and transformation
- Analytical data store schemas and data loads

Data Analyst

- Analytical modeling
- Data reporting and summarization
- Data visualization

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Microsoft cloud services for data

Operational data workloads

Azure SQL

- Family of SQL Server based relational database services

Azure Database for open-source

- Maria DB, MySQL, PostgreSQL

Azure Cosmos DB

- Highly scalable non-relational database system

Azure Storage

- File, blob, and table storage
- Hierarchical namespace for data lake storage

Analytical data workloads

Software-as-a-Service (SaaS)

Microsoft Fabric

Unified, SaaS based analytics platform based on open and governed lakehouse:

- Data ingestion and ETL
- Data Lakehouse
- Data Warehouse
- Data Science and ML
- Realtime Analytics
- Data visualization
- Data governance and management

Platform-as-a-Service (PaaS)

Azure Synapse Analytics

- Integrated solution for data analytics in Azure
- Pipelines, Apache Spark, SQL, Data Explorer

Azure Databricks

- Apache Spark analytics and data processing

Azure HDInsight

- Apache open-source platform

others...

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2: Knowledge check

1 Which one of the following tasks is the responsibility of a database administrator?

- ◌ Backing up and restoring databases
- ◌ Creating dashboards and reports
- ◌ Creating pipelines to process data in a data lake

2 Which role is most likely to use Azure Data Factory to define a data pipeline for an ETL process?

- ◌ Database Administrator
- ◌ Data Engineer
- ◌ Data Analyst

3 Which services would you use as a SaaS solution for data analytics?

- ◌ Azure SQL Database
- ◌ Microsoft Fabric
- ◌ Azure Synapse Analytics

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